UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/598,457	02/08/1996	JAMES E. CURRY	414.013	8452

32127 7590 08/17/2004

VERIZON CORPORATE SERVICES GROUP INC.
C/O CHRISTIAN R. ANDERSEN
600 HIDDEN RIDGE DRIVE
MAILCODE HQE03H14
IRVING, TX 75038

EXAMINER	
BRINEY III, WALTER F	

ART UNIT	PAPER NUMBER
2644	12

DATE MAILED: 08/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	08/598,457	CURRY ET AL.	
	Examiner	Art Unit	
	Walter F Briney III	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 9-27* is/are rejected.

7)☒ Claim(s) *8* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

In response to the applicant's appeal brief (paper 41, filed 18 May 2004), the examiner withdraws the rejections of the previous office action (paper 37, filed 04 November 2003) in view of newly considered, relevant prior art.

This detailed action has been submitted in order to expedite the prosecution concerning the merits of the claims henceforth.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1, 3, and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Wang et al. (US Patent 5,757,929, hereafter Wang).

Wang shows a device meant to be used in communication pairs much like cell phones or the like, except that microphones and speakers are mounted around the head. At each of two such Wang units in bidirectional communication, two of the microphones are placed as near the ears as possible "so that the sound received by the two microphones is similar in nature to that received by the two ears". In other words, these two microphones are meant to detect HRTF-imputed sounds, just as the ears themselves would. Similarly, at each of the two Wang units, the microphone signal transmitted from the other unit is detected and fed to a number of spatially located speakers near the wearer's head. Note that the invention is particularly intended to

create a realistic or natural auditory space. Thus the limitations of claims 1 and 13 are met.

Since there are two units in communication, claim 3 is clearly met.

2. Claims 1, 5, 12, and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Scofield et al. (US Patent 5,272,757, hereafter Scofield).

Scofield shows in Figures 1a and 1b all of the elements of each of the claims.

As to claims 1 and 13, Scofield shows right and left microphones detecting audio signals that have HRTF's imputed by the dummy head in which they are mounted. These two microphones delivering HRTF-imputed audio via a communication channel (consisting of wires or conductors connecting the left side of barrier 24 and elements 22, 20 to elements 32,34 on the right or receiving side of barrier 24) to a remote station (the right side of barrier 24) are the sole structures recited to comprise the "conference station" and hence a conference station comprising "right and left spatially disposed microphones connected to a communications channel for receiving right and left audio signals, wherein the differences between the right and left audio signals represent a head-related transfer function" is met.

Note that "remote" is an entirely relative term and no particular distance between two elements that are remote from each other is specified either in the claims or in Figures 1 and 2 of Scofield or the description. What is reasonably taught to one of ordinary skill is that such conductors ("communication channel") are as long as they need to be, and that is entirely up to the user. Six feet, for example, might be "remote" to an invalid who cannot easily traverse such a distance, etc.

On the other hand, while the connection between recording or transmitting side and the reproducing or receiving side is shown as a "hard" connection, the environment appears to be recording/reproducing. In such case, a recording is made and later reproduced. This is still a "communications channel", albeit one in which the receiving end does not have a "hard" or constant physical connection to the transmitting side at all times between the original transmission and the reproduction or reception.

It is noted from the specification that the language "the differences..." merely means that certain aural cues caused by the pinnae of the dummy head differ between the left and right audio signals. This is of course inherently present in any dummy (or real)-head processed binaural sound, i.e., microphones placed in simulated or real ear canals.

Note that claim 5 is clearly met; claim 12 (loudspeakers on a headset) is taught by Figure 1a.

3. Claims 1, 5, and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Lowe et al. (US Patent 5,105,462, hereafter Lowe '462).

Note Figure 6 of Lowe '462. Conductors 607, 608 constitute the communication channel, 605 and 607 the left and right microphones, 612 and 613 the spatially disposed left and right loudspeakers, etc., with the language analysis of "remote", "communications channel", etc. the same as set forth supra with regard to the rejection using Scofield.

4. Claims 1, 5, and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Begault (US Patent 5,173,944, hereafter Begault '944).

See Figure 1 with left and right microphones on a dummy head, transmitting signals over a "communication channel" to left and right spatially located loudspeakers 42, 44. Language analysis is the same as given with regard to the rejection using Scofield.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 15, 18, 19, 22, 24, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boggs et al. (US Patent 4,734,934) in view of Begault, *3-D Sound for Virtual Reality and Multimedia*, Preface to the NASA Technical Memorandum version, pages 31-67 and 95-112 of the facsimile reprint of August 2000, which is an exact duplicate with no content changes of the edition published in 1994.

Claim 15 is limited to a spatial sound conference system. Boggs discloses a teleconferencing bridge (which may be read as the "communication system", or merely as part of the overall communication system that is inherently present which connects the microphone/transmitting end to the headphone/loudspeaker/receiving end of the system), which imparts spatialized mixing to the input signals (abstract; figure 1). A conferee who is talking is a transmitting station, while every conferee receiving the

talker's signal is a receiving station. Audio signals are transduced by way of microphones (X, Y, N of Figure 1 of Boggs) for each talker and a pair of speakers or headphones (see Boggs, column 4, lines 28-40) for each listener.

Thus all limitations of claim 15 (as exemplary) are met with the exception of the use of HRTF's.

The bridge of Boggs applies a transform to a monaural input from each of n conferees to derive a binaural output to each of n conferees (column 1, line 51-column 2, line 28). The consists of imparting an interaural time difference (ITD in standard parlance in the art) with the additional suggestion that attenuation of one signal or another might also be done to further reinforce the illusion of spatial orientation (column 5, lines 62-66).

The two simple factors to impart directionality to a sound, Interaural Time Difference (ITD) and Interaural Intensity Difference (IID) are basic ones understandable by all persons of normal hearing: a sound from the right, for example, arrives at the right ear sooner than the left, and sounds louder in the right ear than the left. Thus by taking a monaural signal, duplicating it, and delaying and attenuating one of the now two signals relative to the other, it is possible, on presenting the two signals to the two ears of a listener, to impart an apparent spatial location, such as to the right or left. Note that a simple ITD/IID system cannot impart an apparent vertical location, and front to back ambiguity can exist. These are clear deficiencies of the simple ITD/IID system.

ITD and IID and their deficiencies for imparting spatial location, are well-described by the Begault text on pages 31-41.

What Boggs does not do is go one step further, and add HRTF's (Head Related Transfer Functions) to the two signals destined for each listener's ear. The pinnae of the ear (and also hair, clothing, etc near the ears) impart a filtering process to acoustic signals entering the ear, and the filter characteristic differs according to azimuth (horizontal angle) and altitude (vertical angle) or the source relative to the listener's ears.

It is this filtering signature which adds additional information to acoustic signals that enables listeners to discern vertical location of a sound source as well as to disambiguate between front and rear.

All of this information about how to impart realistic spatiality to binaural sound signals was well know prior to the time of filing, as taught at least by the Begault book in the cited pages.

Pages 40-41 of Begault, for example, explain why one of ordinary skill in the art would have found it obvious to incorporate the use of HRTF's into Boggs' invention to improve the spatiality of the resultant binaural sounds. These pages describe the ambiguity of ITD/IID localization and the "Cone of Confusion".

The HRTF, well-described by Begault in pages 41-67, is what allows the human listener to overcome these problems and accurately identify the spatial origin of sounds.

The teachings in the cited pages would have convinced one of ordinary skill in the art, with Boggs before him, that the incorporation of HRTF's into the invention of Boggs would have been desirable and highly beneficial. One of ordinary skill in the art at the time of filing would therefore have been highly motivated to improve the

performance of the Boggs invention by utilizing all the known spatial cues for binaural sound, which are at least ITD, IID, and HRTF's.

The actual implementation of HRTF's is described in Chapter 4 of the Begault text, pages 95-112 of the August 2000 facsimile. Figure 4.17, on page 110, for example, depicts a basic system in which a monaural sound source (labeled "Sound Source" in the figure) has HRTF's imparted to it, with the output delivered to headphones. This system fits perfectly with Boggs, who supplies a monaural signal, processes it for spatiality, and delivers the output to headphones or loudspeakers.

This is just another example of cost versus benefit: for a basic investment, a simple ITD system, possibly with simple IID, can be had, with its attendant deficiencies. For a greater cost, an ITD system with full IID can be had, still with the Cone of Confusion applying, and no vertical localization capability. For a still greater investment, HRTF's can be added, and the result is far superior. Any of these solutions were obvious at the time of filing.

Claim 18 is limited to a spatial sound conference system according to claim 15, as covered by Boggs in view of Begault. As shown in claim 15, Boggs, Begault teach a head-related transfer function, the application of which occurs within a teleconferencing bridge (column 2, line 65-column 3, line 3) (i.e. wherein the head-related transfer function unit is contained in a spatial sound conference bridge). Therefore, Boggs in view of Begault makes obvious all limitations of the claim.

Claim 19 is a method representation of claims 15. It is clear that the apparatus defined by claim 15 inherently performs the exact functions of claim 19. Thus, the

evidence presented in support of the rejection of 15 provides the rationale for the rejection of claim 19.

Claim 22 is a method representation of claim 15. It is clear that the apparatus defined by claim 15 inherently performs the exact functions of claim 22. Thus, the evidence presented in support of the rejection of 15 provides the rationale for the rejection of claim 22.

Claim 24 is essentially the same as the spatial sound conference system of claim 15, the difference being that claim 24 includes a structure for supporting a plurality, or at least two input ports and generating at least two outputs that have been spatialized. Clearly, Boggs in view of Begault meets these limitations. Boggs (figure 1) discloses a conference bridge that imparts spatialized effects to each of at least two inputs.

Claim 27 is limited to a method for conducting a spatial sound conference. Boggs discloses receiving monaural inputs from a plurality of conferees (figure 1, elements SPEECH IN X, SPEECH IN Y) (i.e. receiving at least two monaural audio signals). Filtering the input to create two spatialized output signals (X, XD, Y, YD) (i.e. generating at least two sets of spatialized audio signals from the at least two monaural audio signals), the filter including delay and gain elements (XRDEN, YRDEN; column 5, lines 62-66). As shown in claim 15, the delay and gain elements are not sufficient to define an HRTF, however, claim 15 also provides the discussion and motivation to use an HRTF in the binaural transformation of Boggs (i.e. using at least two head-related transfer functions). The spatialized signals are mixed (47-55; YD+ND) (i.e. compiling at least one composite signal from the at least two sets of spatialized audio signals) and

transmitted to each conferee (FOR X, FOR Y, FOR N) (i.e. transmitting at least one composite signal to a location). Clearly, the signals are meant for a conference and are played at the receiving conferee's station (i.e. and playing at least one composite signal at the location). Therefore, Boggs in view of Begault makes obvious all limitations of the claim.

6. Claims 1-7, 9, and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Minami (US Patent 4,815,132) in view of Doi (US Patent 4,068,091).

Claim 1 is limited to a spatial sound conference system. Minami discloses a stereophonic voice signal transmission system (abstract), one in which multi-party communication is enabled (column 1, line 11-column 2, line 58) (i.e. conferencing). As depicted in figure 1, a transmitting (i.e. a conference station) includes right and left spatially disposed microphones (1R and 1L) connected to a communication channel (symbolized in figure 1 as a line between 1R and 2R). The microphones pick up respective audio signals ($G_R(\omega)$) and $G_L(\omega)$) (i.e. for receiving right and left audio signals). The receiver comprises right and left spatially disposed loudspeakers (2R and 2L).

As pointed out in the applicant's disclosure, Minami does not specify transmitting signals that use a HRTF. Minami only generally discloses providing stereophonic teleconferencing between multiple parties, without specific guidance as to precisely how to place the pickup microphones.

Minami discloses all limitations of the claim except "wherein the differences between the right and left audio signals represent a head-related transfer function". Doi teaches that binaural recording systems have been known for use in stereophonic recording and that binaural recording provides favorable acoustic characteristics, such that it appears that a person is present to a live setting (column 1, lines 11-15). Doi also teaches using a dummy head in such binaural recording to provide a natural recording (column 1, lines 30-32). It has been known to those of ordinary skill in the art that using a dummy head in recording inherently provides a HRTF between the right and left audio signals.

It would have been obvious to one of ordinary skill in the art at the time of the invention to seek any known stereo microphone arrangement to use in the system of Minami, since Minami did not specify how to place or arrange the microphones. One excellent choice that one of ordinary skill in the art had available prior to the time of filing was the so-called binaural implementation as disclosed by Doi, the use of which would have provided teleconferencing with improved localization.

Claim 2 is limited to a spatial sound conference system according to claim 1, as covered by Minami in view of Doi. As depicted by Minami in figures 4A and 4B, each transmitting conferee has transmitting circuitry equipped with an ADPCM compression unit (34) as well as an approximator (30) for compression of a transfer function used to characterize one of the audio signals (i.e. a compression unit connected to the right and left spatially disposed microphones for compressing the right and left audio signals). Minami discloses that each receiving conferee has receiving circuitry equipped with an

ADPCM decompression unit (37) as well as a coefficient circuit (40) for decompression of a transfer function used to characterize one of the audio signals (i.e. and a decompression unit connected to the right and left spatially disposed loudspeakers for decompressing the compressed right and left audio signals). Therefore, Minami in view of Doi makes obvious all limitations of the claim.

Claim 3 is limited to a spatial sound conference system according to claim 1, as covered by Minami in view of Doi. While not depicted by Minami with reference to the preferred embodiment contained therein, Minami does depict in figures 13 and 14 that teleconferencing is at least two-way, therefore, all stations including a remote station will include a microphone, and each conference station will include a loudspeaker. Therefore, Minami in view of Doi makes obvious all limitations of the claim.

Claim 4 is limited to a spatial sound conference system according to claim 3, as covered by Minami in view of Doi. As shown in claim 2, Minami includes compressing and decompressing units. Minami discloses that audio signals must be compressed regardless if stereo signals are transmitted or not (column 1, lines 52-58), thus, a compression unit for the microphone of the remote station and a decompression unit for the speakers of the conference station are inherently present. Therefore, Minami in view of Doi makes obvious all limitations of the claim.

Claim 5 is limited to a spatial sound conference system according to claim 1, as covered by Minami in view of Doi. As shown in claim 1, Doi teaches performing binaural recording in place of stereophonic recording (column 1, lines 11-15), and achieving good results by using a dummy head (column 1, lines 30-32) (i.e. wherein the

right and left spatially disposed microphones are positioned on a dummy head). Therefore, Minami in view of Doi makes obvious all limitations of the claim.

Claim 6 is limited to a spatial sound conference system according to claim 5, as covered by Minami in view of Doi. As shown in claim 4, the remote station and the conference station must have a microphone and loudspeaker, respectively. The loudspeaker is inherently proximal to the dummy head when it is within the conference station. Therefore, Minami in view of Doi makes obvious all limitations of the claim.

Claim 7 is limited to a spatial sound conference system according to claim 5, as covered by Minami in view of Doi. As shown in claim 4, the remote station and the conference station must have a microphone and loudspeaker, respectively. The loudspeaker is preferably a pair of speakers (i.e. right and left spatially disposed loudspeakers) for the production of binaural audio to synthesize spatial effects as taught by Minami. Therefore, Minami in view of Doi makes obvious all limitations of the claim.

Claim 9 is limited to a spatial sound conference system according to claim 1, as covered by Minami in view of Doi. Minami discloses a teleconferencing system with a video camera (figure 13, element 3), thus if a video camera exists in the conference station, a screen must exist in the remote station to receive the video signals (i.e. a display positioned in the remote station and connected through the communication channel to the video camera). Therefore, Minami in view of Doi makes obvious all limitations of the claim.

Claim 12 is limited to a spatial sound conference system according to claim 1, as covered by Minami in view of Doi. Binaural recordings, like those taught by Doi,

inherently require the use of headphones to recreate the recorded sounds (i.e. wherein the right and left spatially disposed loudspeakers are a headset). If headphones are not used, the recorded signal is subject to crosstalk and other distortion effects. Such systems exist, but are referred to as transaural. Therefore, Minami in view of Doi makes obvious all limitations of the claim.

Claims 13 and 14 are method representations of claims 1 and 2, respectively. It is clear that the apparatus defined by claims 1 and 2 inherently performs the exact functions of claims 13 and 14. Thus, the evidence presented in support of rejections 1 and 2 provides the rationale for the rejection of claims 13 and 14.

7. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Minami in view of Doi and further in view of Scofield.

Claim 10 is limited to a spatial sound conference system according to claim 9, as covered by Minami in view of Doi. Minami discloses a video camera (figure 13, element 3), each video camera transmitting a moving image to a screen (4). However, the position of the screen and camera are not disclosed. Therefore, Minami in view of Doi makes obvious all limitations of the claim with the exception wherein the video camera is positioned near the location of eyes on a dummy head. Scofield teaches a binaural system (figure 3), which receives binaural audio input (44) and also displays a video for aid in audio spatialization. Scofield teaches that binaural audio is deficient in permitting a listener to discern if signals are behind, above, below, etc...and that three-dimensional video helps (column 7, lines 16-26). Each listener is equipped with a visor; the visor includes LCD screens that provide three-dimensional focus for each user

(column 7, lines 22-26). It is clear that for such three-dimensional video to assist in spatialization, the camera would be inherently required to be placed in proximity to the eyes of the dummy head to provide image spatialization that matches the audio spatialization. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the three-dimensional video imaging system as taught by Scofield for the purpose of enhancing three-dimensional sound spatialization and that positioning of the camera must be in proximity to the eyes of the dummy head recording apparatus in order to not confuse a listener.

Claim 11 is limited to a spatial sound conference system according to claim 9, as covered by Minami in view of Doi. As shown in claim 10, Scofield teaches providing three-dimensional video for the further realization of audio spatialization. Scofield teaches focusing displays mounted to each listener by a headset (figures 5 and 6) (i.e. wherein the display is a head-mounted display). Therefore, Minami in view of Doi and further in view of Scofield makes obvious all limitations of the claim.

8. Claims 15-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nahumi (US Patent 5,390,177) in view of Boggs and Begault.

Claim 15 is limited to a spatial sound conference system. Nahumi discloses a conferencing arrangement of the prior art (figure 1), which includes signal decoders and encoders, it serves as a bridge between all the conferees (column 2, lines 9-37). Arbitrarily, one of the n conferees disclosed by Nahumi can be considered a transmitting station and one a receiving station. Each station communicates by way of audio signals, thus each station must inherently include both microphones and some type of

loudspeaker arrangement. However, Nahumi does not disclose that the prior art device performs anything beyond an equal gain for all conferees (column 2, lines 15-20). Therefore, no head-related transfer function is imparted onto any of the incoming conference signals. Thus, Nahumi anticipates all limitations of the claim with the exception of a head-related transfer function unit connected to the communications system for imparting a head-related transfer function to the audio signal to produce a spatialized audio signal. Boggs teaches a teleconferencing system, in fact, a bridge component is illustrated in figure 1. The bridge applies a transform to a monaural input from each of n conferees to derive a binaural output to each of n conferees (column 1, line 51-column 2, line 28). As shown in claim 15, Boggs does not actually define an HRTF, but ITD and IID functions. The rationale used in the rejection of claim 15 further provides the motivation to use the teachings of Begault in order to upgrade the performance of Boggs by using an HRTF in place of the simple ITD and IID functions. Clearly, by generating a binaural signal, two signals are presented to each conferee; each inherently requires a loudspeaker in order to maintain the binaural effect (i.e. and a receiving station comprising: right and left spatially disposed loudspeakers connected to the communication system for receiving the spatialized audio signal). Therefore, Nahumi in view of Boggs and Begault makes obvious all limitations of the claim.

Claim 16 is limited to a spatial sound conference system according to claim 15, as covered by Nahumi in view of Boggs and Begault. As shown in the prior art teleconferencing bridge of Nahumi (figure 1), each signal from a transmitting conferee is decompressed (104-1, 104-2, 104-n) (i.e. a decompression unit connected to the head-

related transfer function unit for decompressing the compressed audio signal) before mixing (110), and the mixed signal is compressed (105) before transmission to a receiving conferee (column 2, lines 9-37). Because microphone signals and speaker signals use uncompressed data, a compression unit for the microphone inherently exists (i.e. a compression unit connected to the microphone for compressing the audio signal). Therefore, Nahumi in view of Boggs and Begault makes obvious all limitations of the claim.

Claim 17 is limited to a spatial sound conference system according to claim 15, as covered by Nahumi in view of Boggs and Begault. As shown in the prior art teleconferencing bridge of Nahumi (figure 1), each signal from a transmitting conferee is decompressed (104-1, 104-2, 104-n) before mixing (110), and the mixed signal is compressed (105) (i.e. a compression unit connected to the head-related transfer function unit for compressing the spatialized audio signal) before transmission to a receiving conferee (column 2, lines 9-37). Because microphone signals and speaker signals use uncompressed data, a decompression unit for the loudspeakers inherently exists (i.e. a decompression unit connected to the right and left spatially disposed loudspeakers for decompressing the compressed spatialized audio signal). Therefore, Nahumi in view of Boggs and Begault makes obvious all limitations of the claim.

Claim 18 is limited to a spatial sound conference system according to claim 15, as covered by Nahumi in view of Boggs and Begault. As shown in claim 15, Boggs in view of Begault teaches a head-related transfer function, the application of which occurs within a teleconferencing bridge (column 2, line 65-column 3, line 3) (i.e. wherein the

head-related transfer function unit is contained in a spatial sound conference bridge). Therefore, Nahumi in view of Boggs and Begault makes obvious all limitations of the claim.

Claims 19-21 are method representations of claims 15-17, respectively. It is clear that the apparatus defined by claims 15-17 inherently performs the exact functions of claims 19-21. Thus, the evidence presented in support of rejections 15-17 provides the rationale for the rejection of claims 19-21.

Claims 22 and 23 are method representations of claims 15 and 16, respectively. It is clear that the apparatus defined by claims 15 and 16 inherently performs the exact functions of claims 22 and 23. Thus, the evidence presented in support of rejections 15 and 16 provides the rationale for the rejection of claims 22 and 23.

Claim 24 is essentially the same as the spatial sound conference system of claim 15, the difference being that claim 24 includes a structure for supporting a plurality, or at least two input ports and generating at least two outputs that have been spatialized. Clearly, Nahumi in view of Boggs and Begault meets these limitations. Nahumi (figure 1) discloses a mixing conference bridge with at least two inputs while Boggs (figure 1) in view of Begault teaches a conference bridge that imparts spatialized effects to each of at least two inputs. Therefore, Nahumi in view of Boggs and Begault makes obvious all limitations of the claim.

Claim 25 is limited to a spatial sound conference bridge according to claim 24, as covered by Nahumi in view of Boggs and Begault. As seen in Nahumi (figure 1), a conference bridge within a digital network includes a decompression unit at the input

(104-1, 104-2, 104-n) (i.e. a decompression unit connected to at least one input port for decompressing at least one audio signal). Therefore, Nahumi in view of Boggs and Begault makes obvious all limitations of the claim.

Claim 26 is limited to a spatial sound conference bridge according to claim 24, as covered by Nahumi in view of Boggs and Begault. As seen in Nahumi (figure 1), a conference bridge within a digital network includes a compression unit at the output (105) (i.e. a compression unit connected to at least one output port for compressing at least one spatialized audio signal). Therefore, Nahumi in view of Boggs and Begault makes obvious all limitations of the claim.

9. Claims 15, 18, 19, 22, 24, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boggs in view of Begault (US Patent 5,173,944) and further in view of Koizumi et al. (Proceedings of the Audio Engineering Society Convention, Wien, Austria, March 1992).

Boggs discloses all limitations of claims 15, 18, 19, 22, 24, and 27, but discloses a generic pseudo-stereophonic teleconference bridge that produces a two-channel binaural signal and does not disclose or teach a head-related transfer function. Begault teaches that using the head-related transfer function for pseudo-stereophonic production (i.e. binaural) (column 2, lines 20-22) avoids problems with other forms of pseudo-stereophonic productions. It is not overly reverberant nor does it color the reproduced sound, changing the timbre of the original recording (column 1, line 45-60). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply head-related transfer function measurement as taught by Begault for

the purpose of generating binaural sound from a monaural input signal, wherein head-related transfer functions do not change the timbre of the original recording nor sound overly reverberant.

An article from the proceedings of the Audio Engineering Society Convention of 1992 by Koizumi et al. supports a reasonable expectation of success. In the article, Koizumi discloses a teleconferencing environment wherein each user is presented with a binaural representation of speech from all other users (page 1, paragraph 3-page 2, paragraph 2). The binaural signals are synthesized from monaural speech recordings using HRTF (page 4, second paragraph).

10. Claims 2, 4, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang considered with either Minami, or known prior art.

These claims recite, in addition to the features of their parents, use of compression. Use of compression techniques to reduce bandwidth/bitrates needed in telecommuncations applications was well know at the time of filing, as shown by Minami; use of the ADPCM technique of Minami in Wang to conserve bandwidth would have been obvious. On the other hand, other systems such as MPEG-1 (capable of reducing needed bandwidths by more than 90%) were well know (since 1992 for at least Layers I and II, and 1994 for MPEG-2) were also well known and obvious to use to conserve bandwidth in every-more-crowded RF bands.

Allowable Subject Matter

11. Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 8 is limited to a spatial sound conference system according to claim 5, as covered by Minami in view of Doi. Minami in view of Doi makes obvious a teleconferencing system wherein each station includes circuitry to transmit and receive binaural audio signals. Furthermore, Minami transmits and receives a transfer function at each station in order to derive one of the binaural audio signals from the other. However, the transfer function is not modified based on the positioning of the listener's head. Therefore, Minami in view of Doi makes obvious all limitations of the claim with the exception of **a head-tracking sensor in the remote station connected to the communications channel; and a position simulator attached to the dummy head and connected through the communication channel to the sensor**. Blauert teaches a method of controlling acoustical output of earphones in response to the rotation of the listener's head (abstract). As the rotation of the listener is determined, a signal is fed back to a head related transfer function filter, however, the feedback signal is connected to electronic filtering systems, such as those used to decode the transfer function transmitted to a receiving station in Minami. There is no connection to the dummy head-recording instrument. While head-tracking has been known in the prior art, it has not been used to manipulate or control any circuitry coupled to a dummy head; therefore, claim 8 is allowable over the cited prior art.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter F Briney III whose telephone number is 703-305-0347. The examiner can normally be reached on M-F 8am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W Isen can be reached on 703-305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

WFB
8/6/04

FORESTER W. ISEN
SUPERVISORY PATENT EXAMINER